


SOT-223

TO-252-3L

TO-220F-3L

ORDERING INFORMATION

Product	Marking	Package
S78DxxQ	S78DxxQ	SOT-223
S78DxxD	S78DxxD	TO-252-3L
S78DxxPI	S78DxxPI	TO-220F-3L

▲ Marking Detail Information

[SOT-223 PKG Marking]

S78Dxxx ①
GYWW ②

① Device Code

② Grade & Year & Week Code

[TO-220F-3L & TO-253-3L PKG Marking]

AUK ①
G△YWW ②
S78Dxxx ③

① AUK Logo

② Grade & M Code & Year & Week Code

③ Device Code

S78Dxxx

Low Dropout Voltage Regulator (1.0A Series)

Description

The S78Dxxx is an efficient linear low dropout voltage regulator for various electronic equipment. It is designed to provide very low dropout voltage, and better than 2.4% output voltage accuracy.

And the S78Dxxx has various key features such as current limiting, over temperature shut-down, over voltage protection, and low noise performance with an low noise option.

Furthermore, it is available in adjustable or fixed output voltages in SOT-223, TO-252-3L and TO-220F-3L packages.

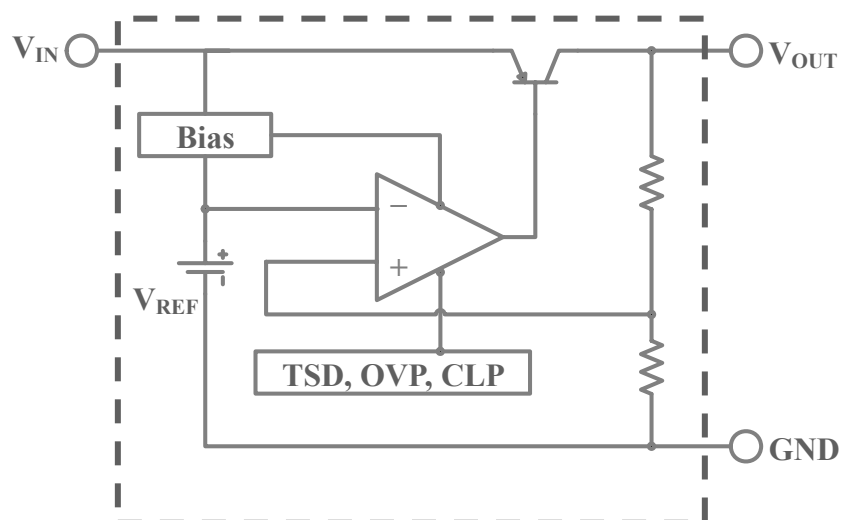
Application

- ◆ Consumer and personal electronics
- ◆ SMPS post-regulator / dc-to-dc modules
- ◆ High-efficiency linear power supplies

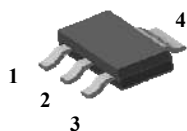
Features and Benefits

- ◆ Low Dropout Voltage for 1.0A Output : [Max. 500mV].
 - ◆ Built in Thermal shut down circuit.
 - ◆ Built in OVP, CLP circuit.
 - ◆ Low Quiescent Current : [Typ. 2.0mA]
 - ◆ Ultra High level of ESD [Built in ESD Protection Cell]
- MM : 400V ↑ / HBM 3KV ↑

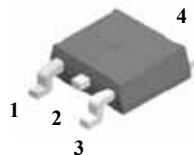
Equivalent Circuit



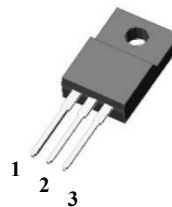
◆ Pin Configuration

**SOT-223**

1: V_{IN}
 2: GND
 3: V_{OUT}
 4: GND

**TO-252-3L**

1: V_{IN}
 2: GND
 3: V_{OUT}
 4: GND

**TO-220F-3L**

1: V_{IN}
 2: GND
 3: V_{OUT}

◆ Product Line-up

Product Name	V_{OUT}	Operating Temperature	Package
S78D18Q	1.8V	-30~125°C	SOT-223
S78D25Q	2.5V	-30~125°C	SOT-223
S78D33Q	3.3V	-30~125°C	SOT-223
S78D50Q	5.0V	-30~125°C	SOT-223
S78D18D	1.8V	-30~125°C	TO-252-3L
S78D25D	2.5V	-30~125°C	TO-252-3L
S78D33D	3.3V	-30~125°C	TO-252-3L
S78D50D	5.0V	-30~125°C	TO-252-3L
S78D18PI	1.8V	-30~125°C	TO-220F-3L
S78D25PI	2.5V	-30~125°C	TO-220F-3L
S78D33PI	3.3V	-30~125°C	TO-220F-3L
S78D50PI	5.0V	-30~125°C	TO-220F-3L

◆ **Absolute Maximum Ratings (Ta = 25°C)**

Parameter		Symbol	Limits	Unit
Input Voltage		V _{IN}	23.0	V
Power Dissipation	SOT-223	P _d	1.0(Note1)	W
	TO-252-3L		1.3(Note2)	
	TO-220F-3L		2.0(Note2)	
Junction Temperature		T _J	150	°C
Operate Temperature Range		T _{opr}	-30 ~ +125	°C
Storage Temperature Range		T _{stg}	-55 ~ +150	°C

Note 1 : Mount on a glass epoxy circuit board of 36x18mm pad dimension of 50mm²

Note 2 : No Heat-Sink

Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature, T_{J(max)}, the junction-to-ambient thermal resistance, θ_{JA} , and the ambient temperature, T_A.

The maximum allowable power dissipation at any ambient temperature is calculated using:

$PD(max) = (T_{J(max)} - T_A) \div \theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

◆ **Guaranteed Operating Conditions (Ta = 25°C)**

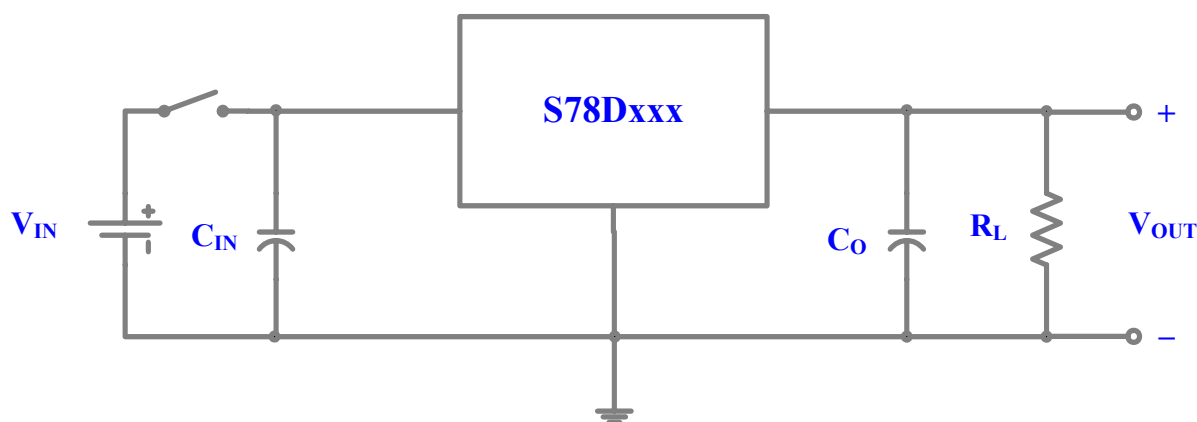
Parameter	Symbol	Limits	Unit
Supply Input Voltage	V _{IN}	V _O +0.5~20	V
Output Current	I _{OUT}	1.0	A

◆ Electrical characteristics

($V_{IN}=V_{OUT}+1.0V$, $C_{IN}=0.33\mu F$, $C_{OUT}=47\mu F$, $I_{OUT}=5mA$, $T_J=25^{\circ}C$; unless noted)

NO	Characteristics		Symbol	Condition	Specification			Unit
					MIN.	TYP.	MAX.	
1	Output Voltage	S78D18x	V_{OUT}	Variation from nominal V_{OUT}	1.764	1.800	1.836	V
		S78D25x			2.450	2.500	2.550	V
		S78D33x			3.234	3.300	3.366	V
		S78D50x			4.900	5.000	5.100	V
2	Line Regulation		V_{LINE}	$V_{IN}=V_{OUT}+1V$ to 12V, $I_{OUT}=5mA$	-	0.05	0.5	%
3	Load Regulation		V_{LOAD}	$V_{IN}=V_{OUT}+1V$, $I_{OUT}=5mA$ to 1A	-	0.1	1.0	%
4	Quiescent Current		I_{QC}	$V_{IN}=V_{OUT}+1V$ to 20V, $I_{OUT}=0mA$	-	2.0	5.0	mA
5	Ripple Rejection		$R \cdot R$	$I_{OUT}=50mA$, $f=120Hz$	55.0	65.0	-	dB
6	Output Noise Voltage		V_{NO}	$V_{IN}=V_{OUT}+1V$, $I_{OUT}=50mA$, $10Hz \leq f \leq 100kHz$	-	100	-	μV_{rms}
7	Dropout Voltage		V_{DROP}	$I_{OUT}=1.0A$	-	-	0.5	V
8	Current Limit		I_{LIMIT}	$V_{IN}=V_{OUT}+1V$	1100	1300	-	mA

Typical Application



- 1) C_{IN} should be required if regulators are located far from power supply filter
- 2) C_O improves output stability and transient response ($C_O \geq 47\mu F$)

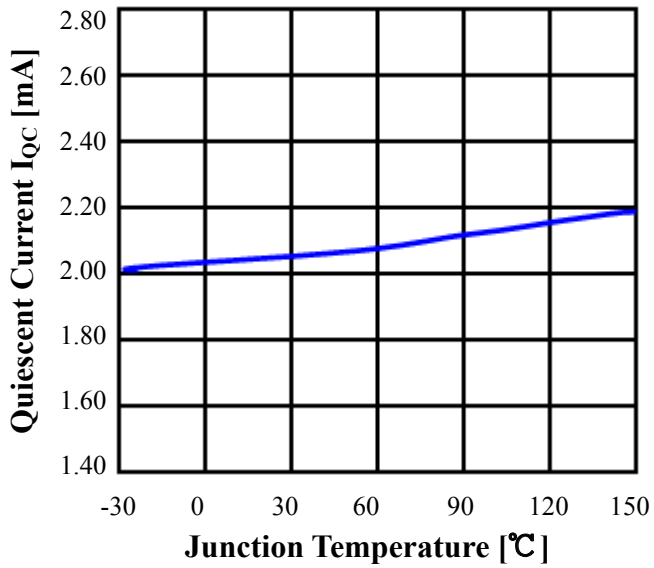
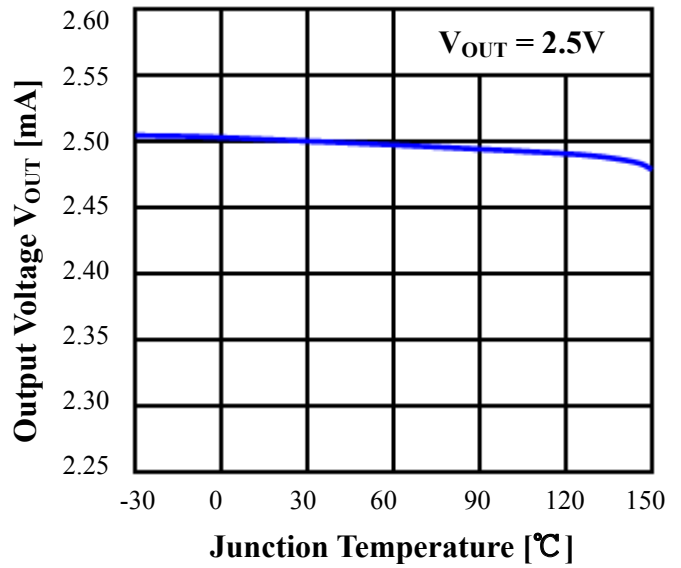
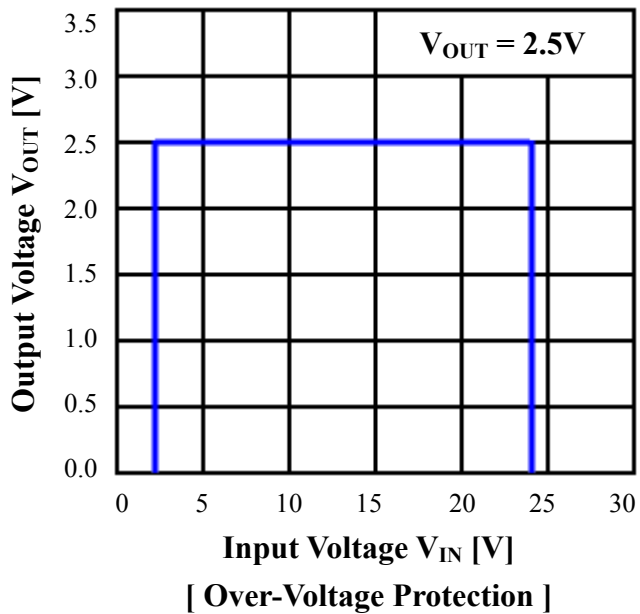
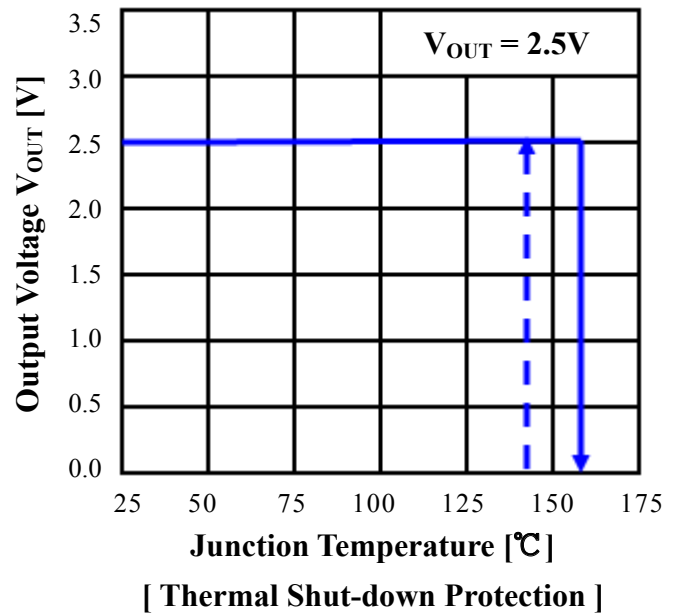
Fig1. $I_{QC} - T_J$ Fig2. $V_{OUT} - T_J$ Fig3. $V_{OUT} - V_{IN}$ Fig4. $V_{OUT} - T_J$ 

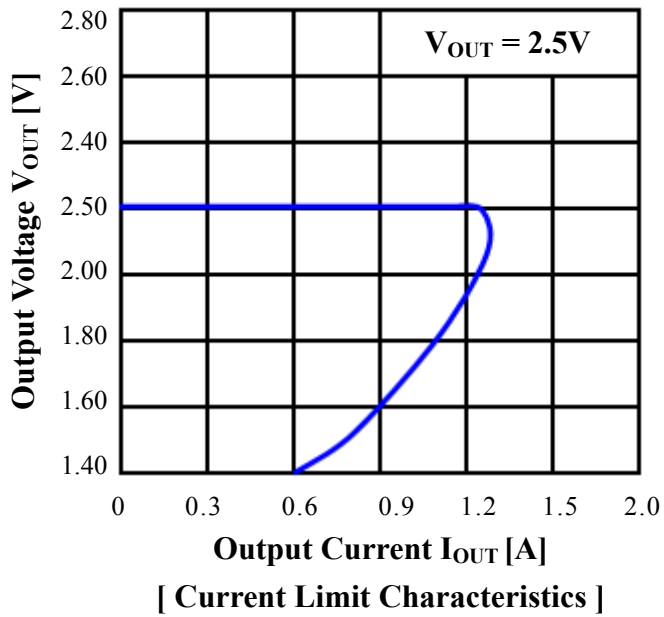
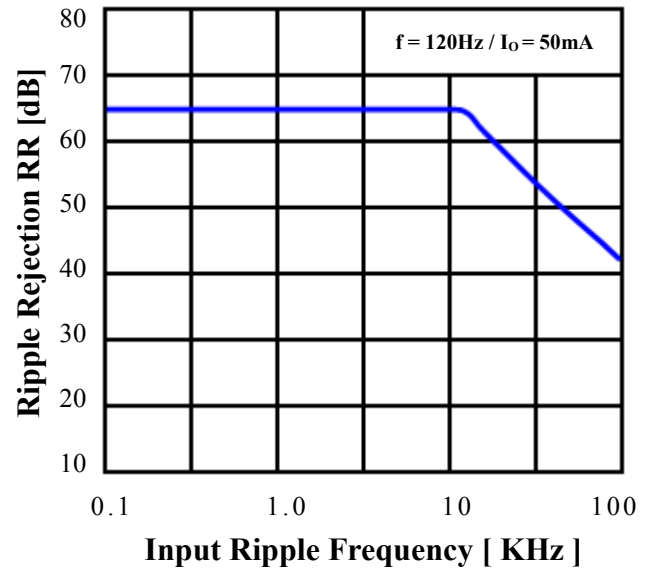
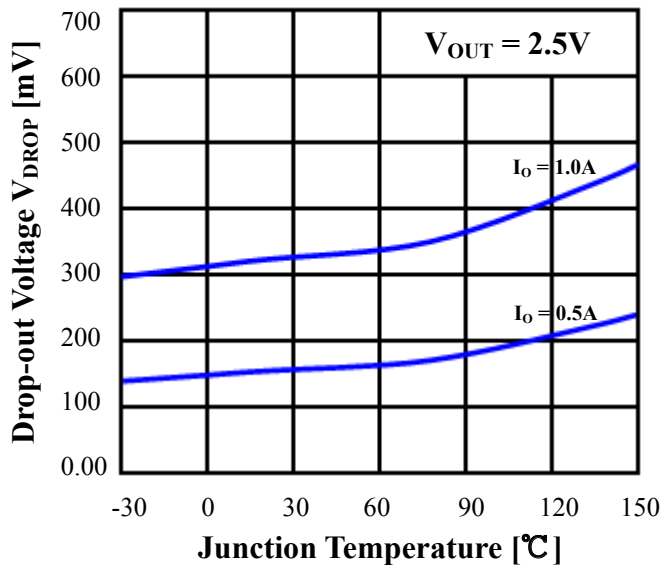
Fig5. $V_{OUT} - I_{OUT}$ Fig6. $V_{OUT} - T_J$ Fig7. $V_{DROP} - T_J$ 

Fig.8 Line Transient Response

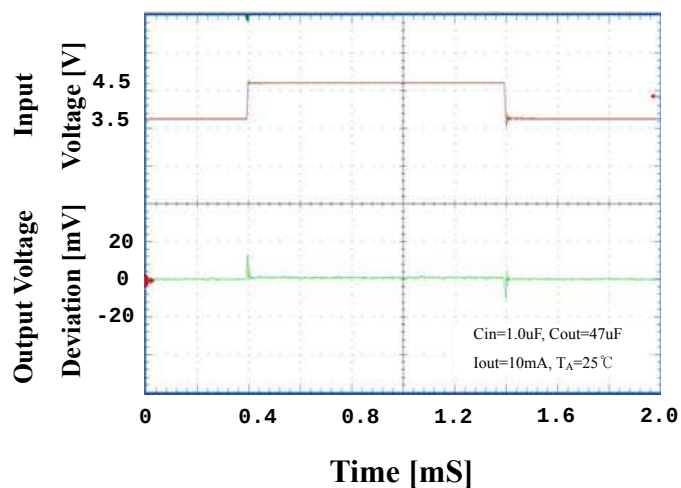


Fig.9 Line Transient Response

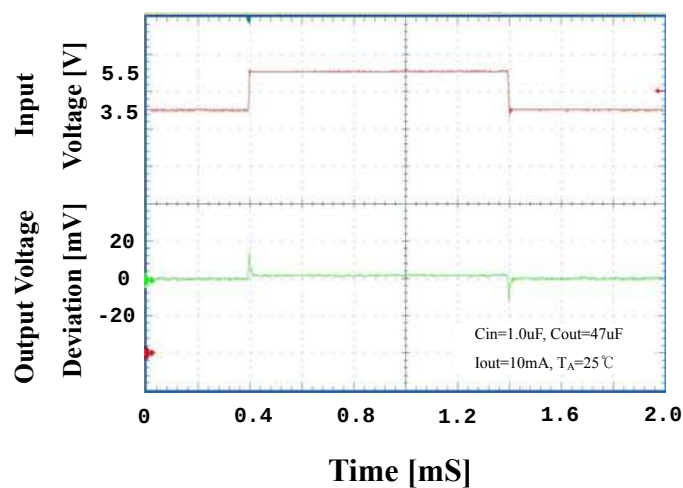


Fig.10 Load Transient Response

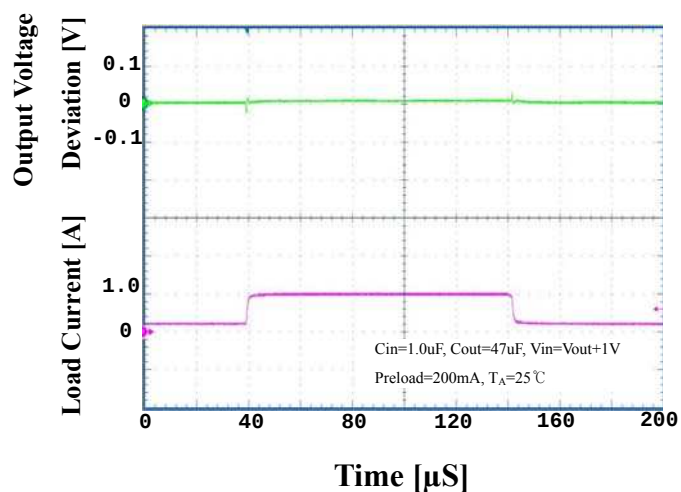
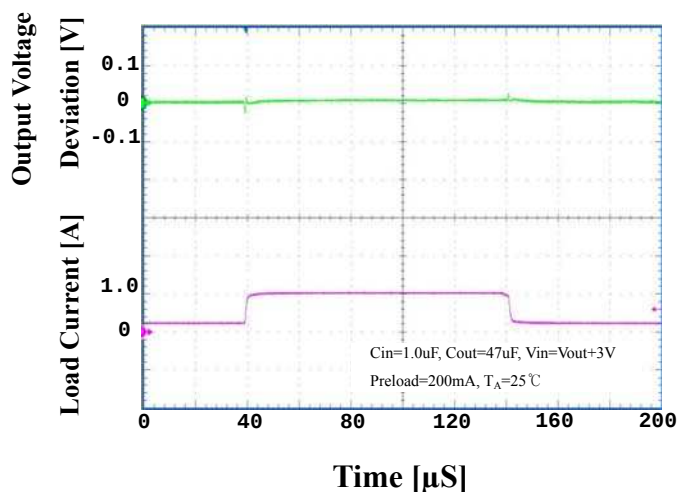
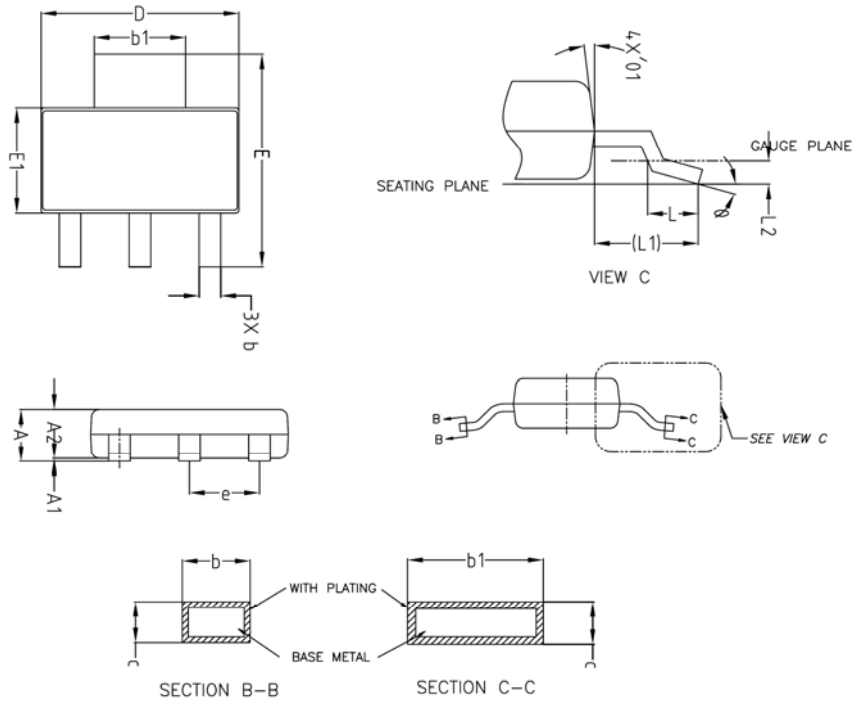


Fig.11 Load Transient Response

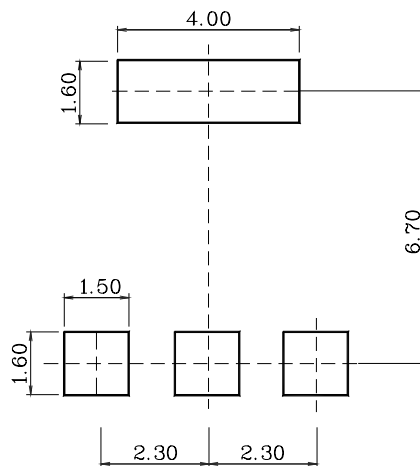


◆ SOT-223 Outline Dimension (Unit : mm)

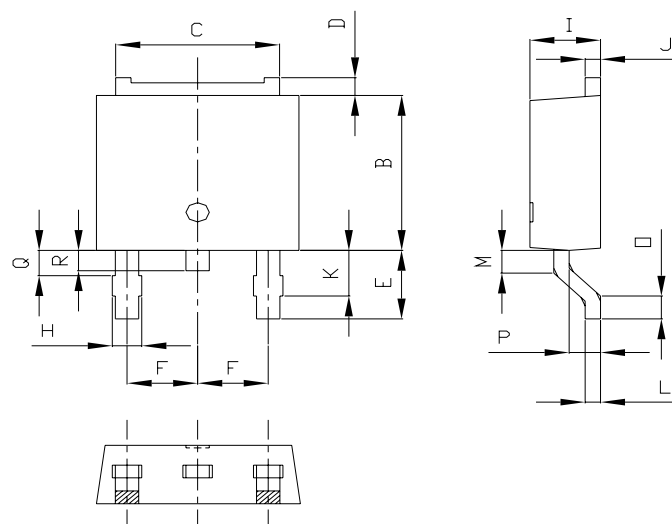


SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	—	—	1.80	
A1	0.00	—	0.10	
A2	1.60	1.65	1.70	
b	0.68	—	0.76	
b1	2.95	—	3.07	
c	0.23	—	0.28	
D	6.40	6.50	6.60	
E	6.80	7.00	7.20	
E1	3.40	3.50	3.60	
e	2.30 BSC			
L	0.45	—	0.65	
L1	1.75 REF			
L2	0.10 BSC			
θ	0°	—	10°	
θ1	5°	—	10°	

※ Recommend PCB solder land [Unit: mm]

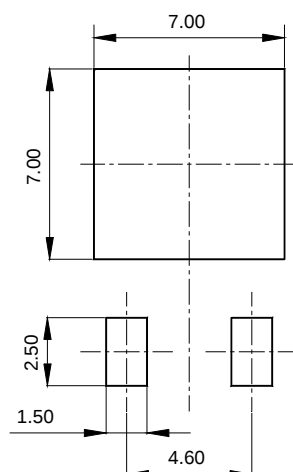


◆ TO-252-3L Outline Dimension (Unit : mm)

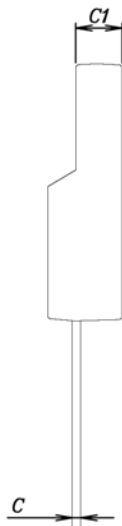
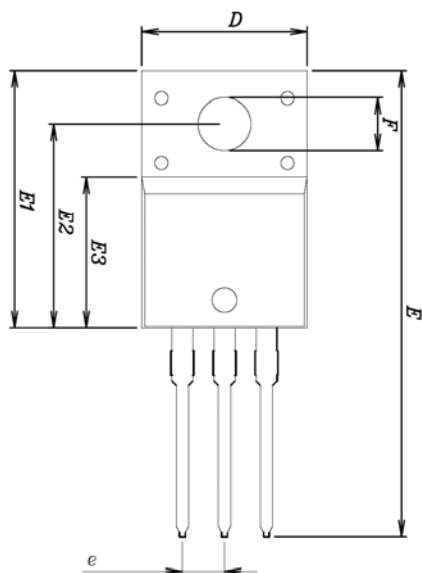


SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	6.40	6.60	6.80	
B	5.90	6.10	6.30	
C	5.04	5.34	5.64	
D	0.50	0.70	0.90	
E	2.50	2.70	2.90	
F	2.10	2.30	2.50	
H	0.96 MAX			
I	2.20	2.30	2.40	
J	0.40	0.50	0.60	
K	1.60	1.80	2.00	
L	0.40	0.50	0.60	
M	0.81	0.91	1.01	
O	0.80	0.90	1.00	
P	0.90	1.00	1.10	
Q	0.95 MAX			
R	0.60	0.80	1.00	

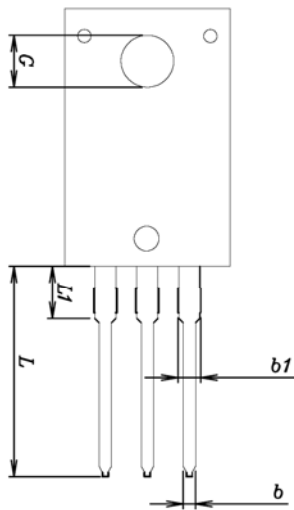
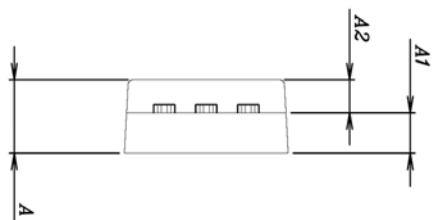
※ Recommend PCB solder land [Unit: mm]



◆ TO-220F-3L Outline Dimension (Unit : mm)



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	—	—	4.60	
A1	2.45	2.50	2.55	
A2	1.95	2.00	2.05	
b	0.65	0.75	0.85	
b1	1.07	1.27	1.47	
C	0.40	0.50	0.60	
C1	2.70	2.80	2.90	
D	9.90	10.00	10.10	
E	28.00	—	28.60	
E1	15.50	15.60	15.70	
E2	12.30	12.40	12.50	
E3	9.15	9.20	9.25	
F	3.10	3.20	3.30	
G	3.30	3.40	3.50	
e	2.54 BSC			
L	12.40	—	13.00	
L1	3.46 BSC			



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